User's Manual

PADAUK FPPA™

IDE User's Manual

Preliminary

Version 0.40 – Dec. 28, 2006

10F-2, No. 1, Sec. 2, Dong-Da Road, Hsin-Chu 300, Taiwan, R.O.C.

TEL: 886-3-532-7598 www.padauk.com.tw

Important Notice

PADAUK Technology Co., Ltd.（PADAUK Technology）reserves the right to change this documentation without prior notice. Information provided by PADAUK Technology is believed to be accurate and reliable. However, PADAUK Technology makes no warranty for any errors which may appear in this document. Please contact PADAUK Technology to obtain the latest version of device specifications before placing your order. No responsibility is assumed by PADAUK Technology for any infringement of patent or other rights of third parties which may result from its use. In addition, PADAUK Technology products are not authorized for use as critical components in life support systems or aviation systems, where a malfunction or failure of the product may reasonably be expected to result in significant injury to the user, without the express written approval of PADAUK Technology.

Warranty Policy

Thanks for choosing products from PADAUK Technology to be the solution in your system. About this system developing kit, PADAUK Technology offers warranty for this product for one year service from the date of sale to the customer. Should the product malfunction or exhibit any defect within the warranty period, PADAUK Technology shall either repair or replace the defective product free of charge in accordance with the warranty policy，however，that a certain repair or service fee will be charged to the customer if：

I. The product failure or damage has been made by its misuse，unauthorized modification or repair.

II. The product failure or damage is due to the act of buyers，such as transporting，moving or dropping the product after its purchase。

III. The product failure or damage has been caused by an external or environmental factor such as fire，an earthquake，lightening，wind and flood，or abnormally high voltage。

IV. The failure of damage is due to connection to another device。

During this one year warranty period，the customer shall return all package contents and accessories along the main unit，describing the failure phenomenon，sending this kit to PADAUK technology。The company address is：10-F, No. 1, Sec. 2, Dong-Da Road, Hsin-Chu 300, Taiwan, R.O.C. and company web site is www.padauk.com.tw。

Table of Content

Revision History

Revision	Date	By	Remark
V0.10	2006/6/16	Chamber Ling	Preliminary 1st edition
V0.20	2006/9/19	Tom Tang	Preliminary 2nd edition
V0.30	2006/10/19	Tom Tang	Preliminary 3rd edition
V0.31	2006/11/16	Peggy Chen	Padauk → PADAUK
V0.40	2006/12/12	Tom Tang	Update ICE picture, ICE kit and Writer Kit

1. INTRODUCTION

The PDK8S FPPA™ Integrated Development Environment（IDE）which provides an environment for designer to develop and debug the system。It includes an PDK8S-I In-Circuit Emulator（ICE）、PDK8S-P Program-Writer and integrated development software。

The PDK80S-I is an ICE which is designed to emulate PADAUK FPPA™（Field Programming Processor Array）PDK80C series devices。The PDK80S-I performs basic functions such as run、single step、run、breakpoints and halt，advanced features such as processor array monitor and data monitor。The PDK8S-P is used to write the program code to the PDK80C series devices。

The PDK8S FPPA™ IDE is a window-based software，including editor、assembler、debugger and program writer。The USB port is used to connect the PC for both ICE PDK8S-I and program writer PDK8S-P，be easier for user to connect to the PC no matter desktop PC or notebook computer。Especially，both ICE PDK8S-I and program writer PDK8S-P can be operated normally by using power from USB bus，it means that no more power adaptor is required when using PDK8S FPPA™ IDE。

2. Getting Started

2-1、Characteristic of FPPA™ ICE

The FPPA™ products are implemented by an epoch-making architecture，multiple processors are built in one silicon die，being capable of running each own program in parallel；However，the experience of system and program development can be inherited from that of traditional MCU。System engineer can enjoy the power of multiple processors after learning the instruction command sets。

The FPPA™ IDE is designed for system engineer to develop their system products，including program editor、assembler and debugger。By using the Program Writer from PADAUK Technology， a multiple processors product can be finished in this FPPA™ IDE environment。The features of FPPA™ IDE is listed as below：

- Windows-based user interface。It is more easier for system engineer to use。
- USB interface。It can be used for most popular PC both desktop and notebook。
- USB bus power。No power adaptor，provides neat and convenient environment for user。
- Built-in assembler。All developing activity can be finished in the same windows。
- Debugging can be finished by using single step、breakpoint and tracking。
- Provides tracking of multiple processors to develop program easily。
- Built-in OTP Program Writer to program the chip in the same windows。

2-2、FPPA™ IDE Components

2-2-1、FPPA™ ICE Kit

The components of FPPA™ ICE kit include the following hardware and accessories as shown in Fig.2-1，please check it after opening this packed kit and contact us if any shortage，we shall send you the parts as soon as possible。

1. FPPA™ ICE PDK8S-I one。
2. USB cable for PDK8S-I one。
3. Install CD one。

   The contents in CD include：

   - Software Driver of USB interface for Windows 98SE/ME/NT/2000/XP。
   - Windows-based Integrated Development Environment (IDE)，including FPPA™ assembler。
   - FPPA™ product datasheet。
   - This User manual。

Fig.2-1: FPPA™ ICE Kit

2-2-2、FPPA™ Program Writer Kit

The components of FPPA™ Program Writer kit include the following hardware and accessories as shown in Fig.2-2:

1. FPPA™ ICE PDK8S-P one。
2. USB cable for PDK8S-P one。
3. Install CD one。

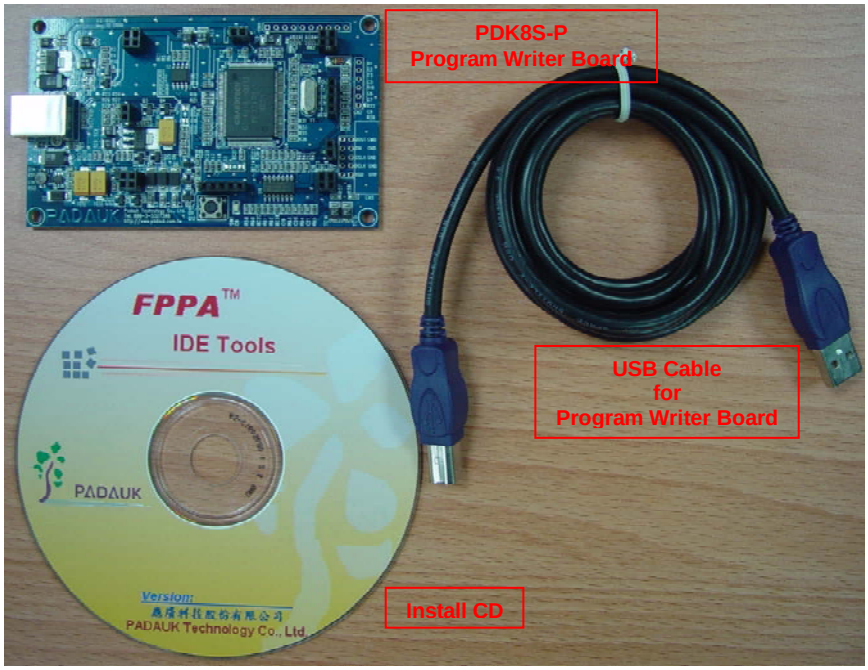

Fig.2-2: FPPA™ Program Writer Kit

2-3、System and Hardware Requirement

- USB1.1 or USB2.0
- Windows 98/ME/NT/2000/XP
- 4MB free Hard Disk space
- 32MB system RAM or above

3. IDE Software and USB Device Driver Installation

3-1、IDE Software Installation

Before connecting the hardware accessories，please install the IDE software and USB device driver，follow the steps to install the IDE software：

Step 1：If your PC has been set to CD-ROM auto-load mode，the IDE software will be installed automatically；If not，please execute the setup.exe in the root directory of CD-ROM，the window for IDE setup will be the Fig. 3-1。

Fig.3-1: FPPA™ IDE Setup Screen

Step 2：Click【Install Products】，the window of Installation Utility is shown as Fig.3-2。

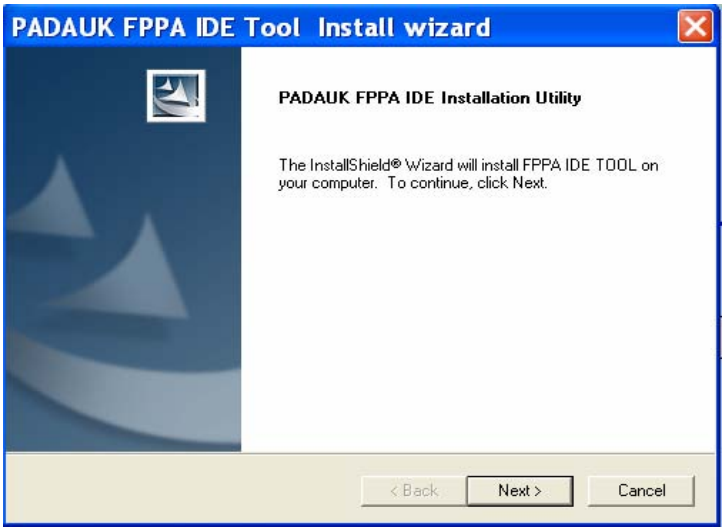

Fig.3-2：Installation Utility

Step 3：Click【Next】，the window of License Agreement is shown as Fig.3-3。

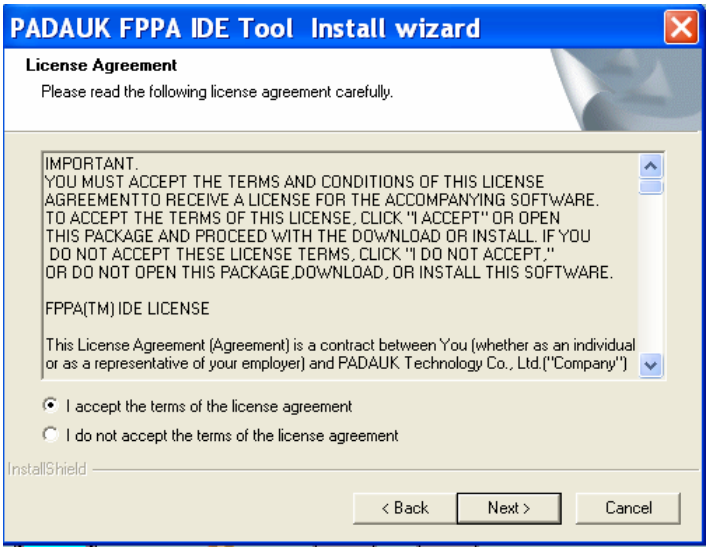

Fig.3-3： License Agreement

Step 4：Choose 【accept】，then click【Next】，the window is shown as Fig.3-4。

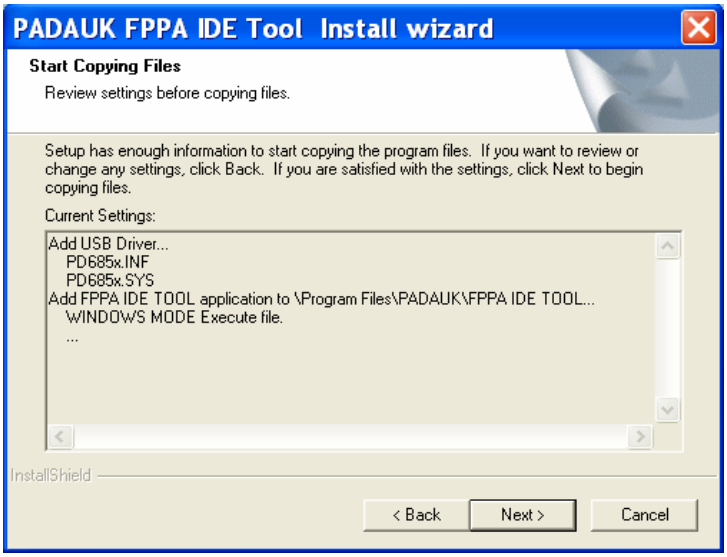

Fig.3-4： Installation Setting

Step 5：Click 【Next】，the window is shown as Fig.3-5 and the IDE installation is successful。

Fig.3-5：Install Complete

3-2、File Description

After installing the FPPA™ IDE software，there are some files in the directory C:\Program Files\PADAUK\：

- .\FPPA IDE TOOL\CODE.exe：It's the FPPA™IDE execution file。
- .\FPPA IDE TOOL \FPPAIDE.INI：Initial setting file for IDE and will be updated for every executing。
- .\FPPA IDE TOOL \PDIDEOS.usb：File for USB system management in operating system，***please don't remove or rename it***。
- . \FPPA IDE TOOL *.def：Registers definition of FPPA™ products，***please don't remove or rename it***。

3-3、USB Device Driver Installation

After installing the IDE successfully，the files for USB device driver of FPPA™ products will be copied to the directory which is specified by the operating system。The USB device driver for FPPA™ products can support Win98 SE/Windows NT/Windows 2000/Windows XP operating system。If the USB device driver can not be installed automatically，you can install the USB device driver manually，the following steps are shown to install it in the Windows XP：

Step 1：Click 【My Computer】by using mouse right button，then select【Properties】，the window of System Properties will be shown as Fig.3-6。

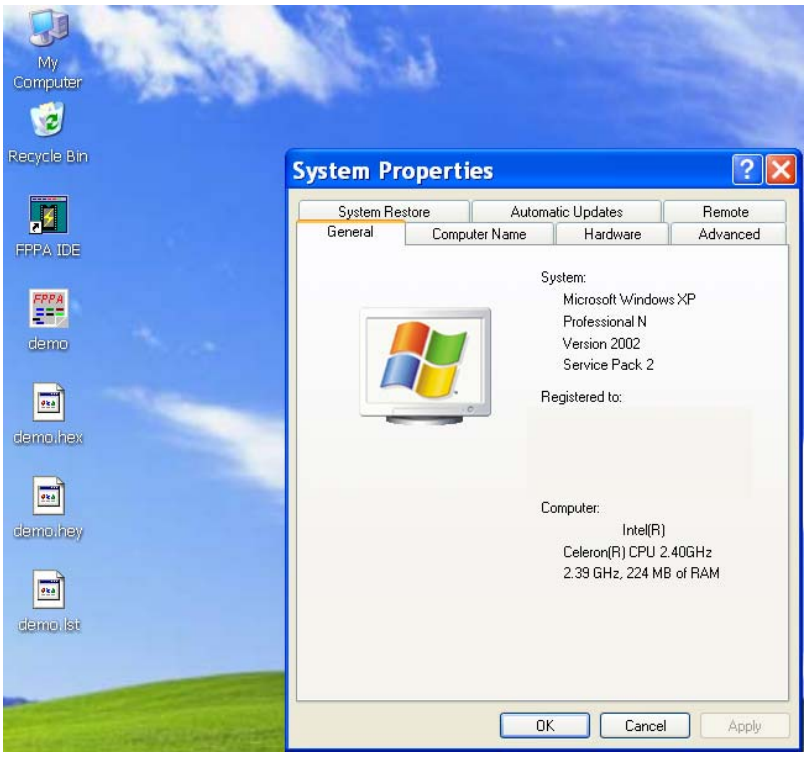

Fig.3-6：System Properties of My Computer

Step 2：Click 【Hardware】，then click【Device Manager】；The Device Manager in Hardware of System properties will be shown as Fig.3-7。

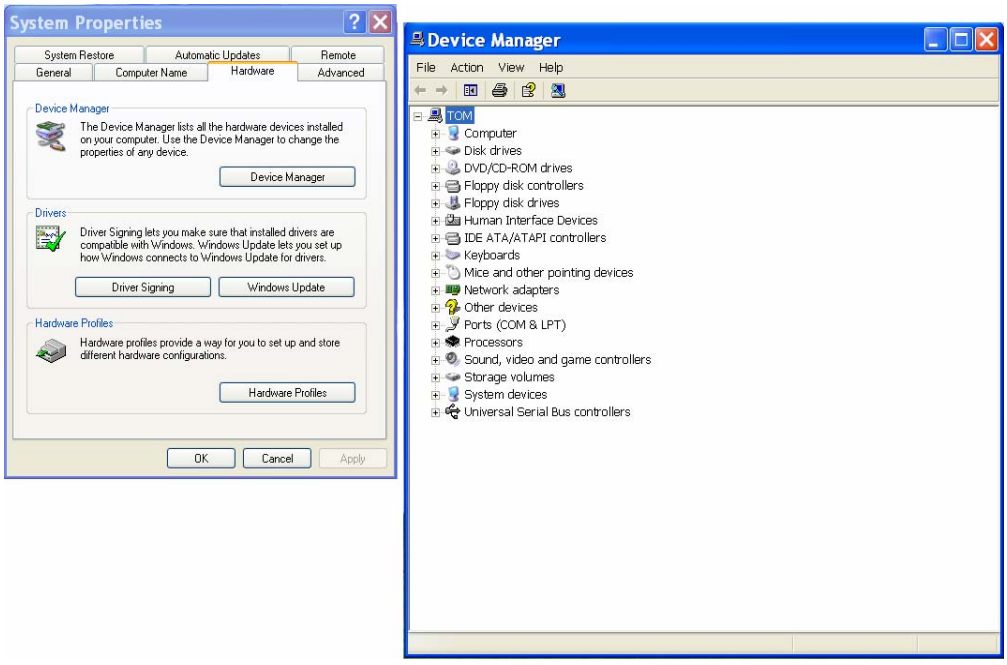

Fig.3-7：Device Manager in Hardware of System Properties

Step 3：Click the folder of【Universal Serial Bus Controllers】，then use mouse right button to select 【Properties】 of PADAUK PD685X USB Tools Controller；The window will be shown as Fig.3-8。

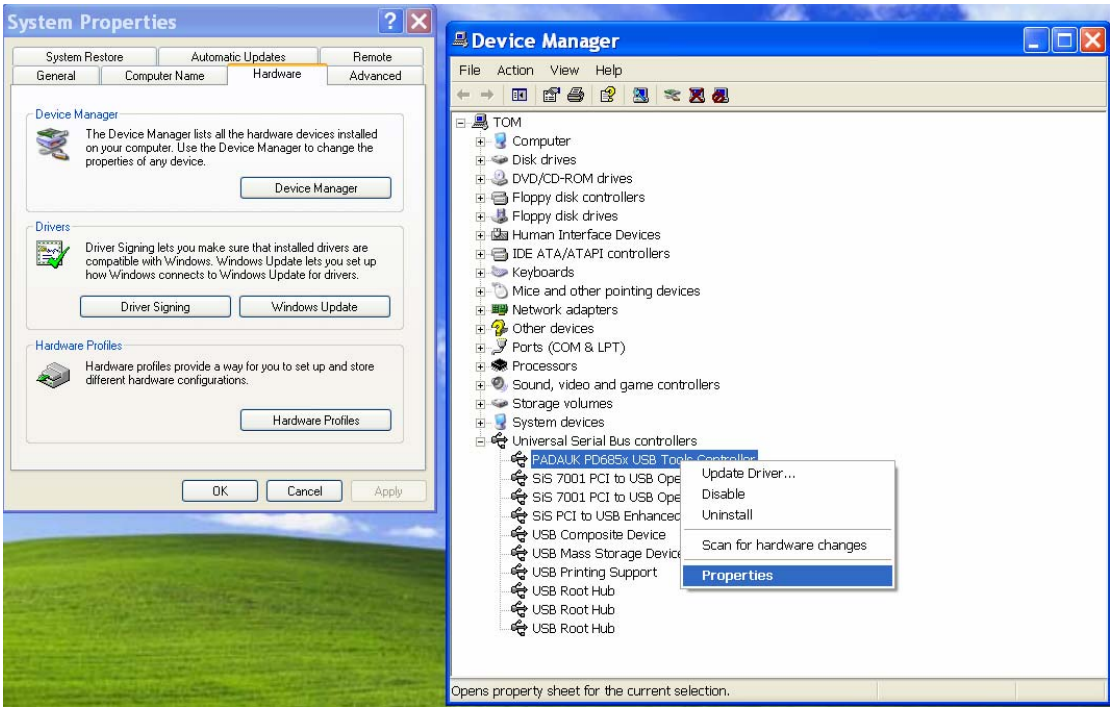

Fig.3-8：Select Properties of PADAUK PD685X USB Tools Controller

Step 4：Click 【Driver】，then click【Update Driver】 in the window of PADAUK PD685X USB Tools Controller；The window of Hardware Update Wizard will be shown as Fig.3-9，then select【Install from a list or specific location】。

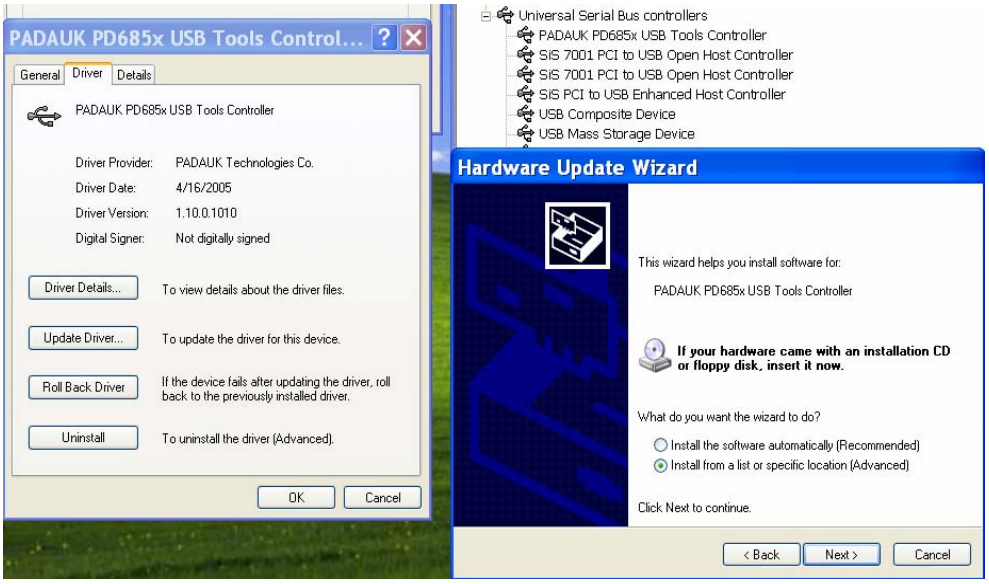

Fig.3-9：Hardware Update Wizard from PADAUK PD685X USB Tools Controller

Step 5：Click 【Next】，the Hardware Update Wizard will search the device driver，the window will be shown as Fig.3-10。You must specify the location of USB device driver located。

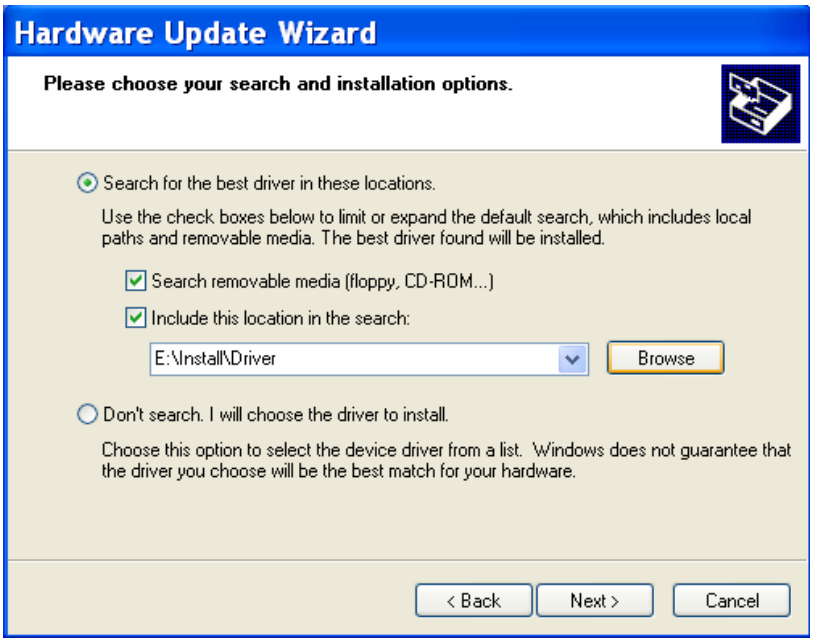

Fig.3-10：The location of USB Device Driver

Step 6：Click【Next】，the wizard will install the software and have warning of Windows Logo as Fig.3-11。

Fig.3-11：The warning of Windows Logo

Step 7：Click【Continue Anyway】to continue installing。After finishing installing，the window will be shown as Fig.3-12。Then, the USB device driver is installed successfully。

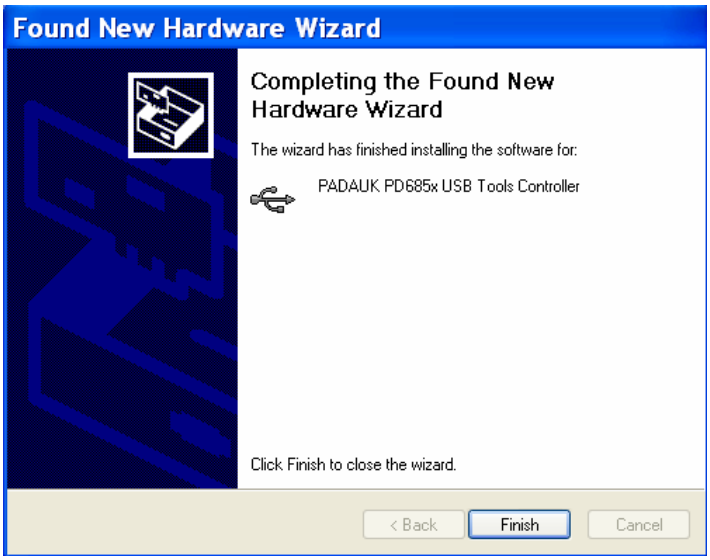

Fig.3-12：The window of finishing installing

4. How to Use FPPA™ IDE

The functions of program edit、assembler compiler、debug and program writer are included in the FPPA™ IDE software。In the windows-based developing environment，user can develop and debug the system easily。

4-1、Files Description

For the FPPA™ IDE operation，there are four files must be put on the same directory。The source file is DEMO.asm（DEMO.asm as example）and all the files are generated after executing assembler。The HEX format does not be compatible to any format in the current market，it is proprietary format defined by PADAUK Technology。

DEMO.asm：Program source code，it is a text file。

DEMO.hex：It is the machine code to be programmed into the chip。

DEMO.hey：It is the machine code to download to ICE board for emulation。

DEMO.lst：List file for debugging。

4-2、Start FPPA™ IDE

After installing the software successfully，there will be a short-cut "FPPA IDE" in the 【Desktop】，double click 

to execute this program。You can start a new project from the menu "File -> New" ，or you can continue an old project from the menu "File -> Open"。Fig.4-1 shows the window screen from opening an old project named "demo"。 The programmer can use "Edit Window" to write the program source code，most functions for editing are included。

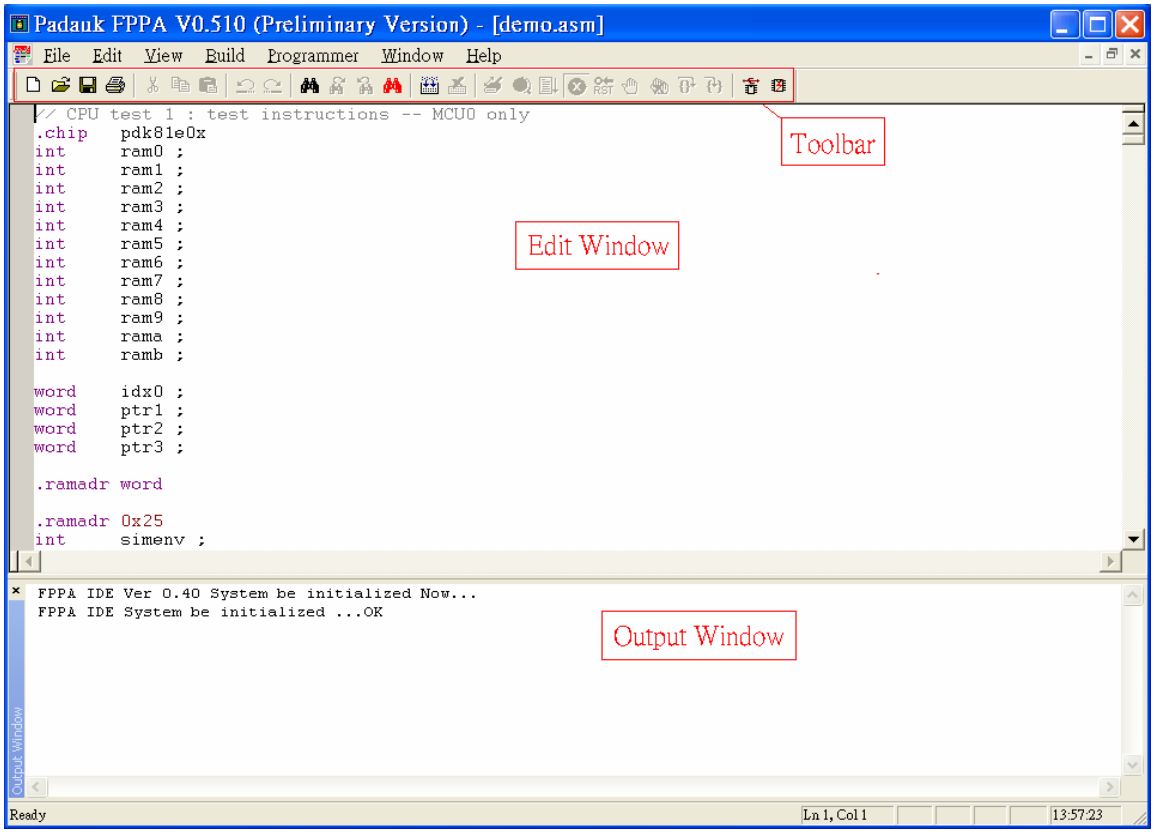

Fig.4-1：Select File for Project

4-3、Debug Project

Step 1：After finishing the program source code，executing the assembler by click  in the toolbar，or pressing hot key "F7"，or select the command "Build -> Build" from menu。The Fig.4-2 shows the information after executing assembler，including the error message、warning message、program memory usage and data memory usage。

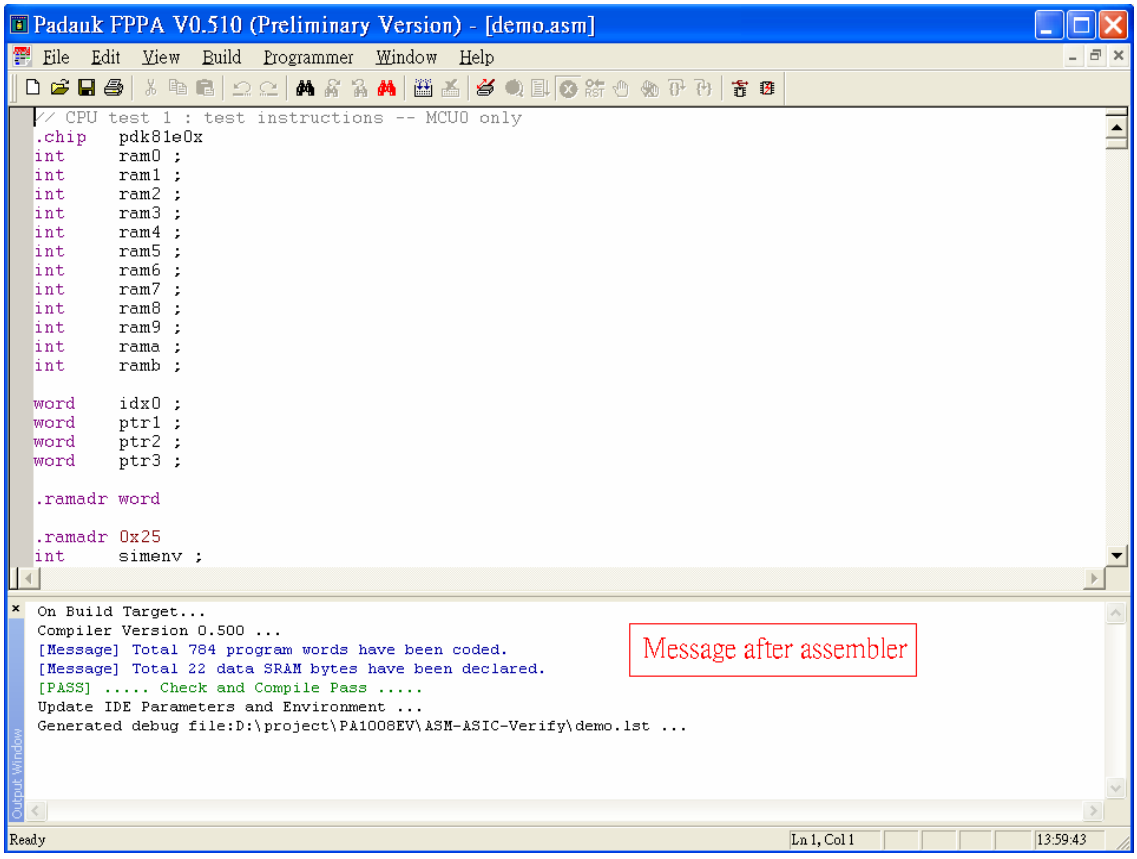

Fig.4-2：Message after Executing Assembler

Step 2：Before going to step 2，you must make sure there is no error message in executing assembler and ICE board is connected to the USB port，and then click  to connect ICE board to USB port and download program machine code to ICE board or select command "Programmer -> Connect" from menu。If ICE connection is okay and program code is downloaded successfully，the message in the IDE window will be shown as Fog.4-3。

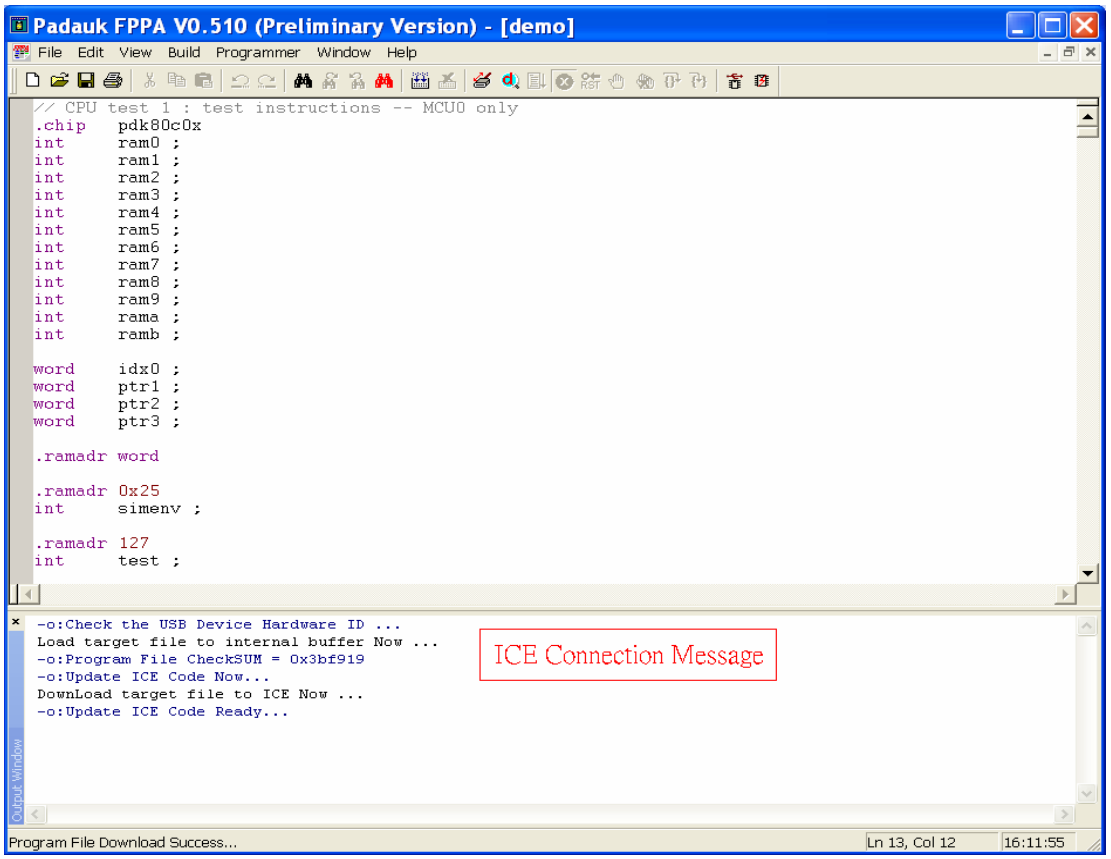

Fig.4-3：Message after ICE Connection and Download

Step 3：Click  to start the debug mode and open the list file（DEMO.lst）。Besides "Output Window"，"FPPA Window"、"Registers Window"、"Memory Window" and "Watch Window" can be selected from "View" menu，in order to debug the program easily，the screen will be like Fig.4-4 if all the windows are opened。The "FPPA Window" shows the status for each FPP unit，the "Registers Window" shows the status of registers inside the chip，the "Memory Window" shows the value of internal data memory and the "Watch Window" is used to monitor the value of selected names which are specified by user。In the "Watch Window" ，you can monitor that the current breakpoint belongs to which FPP unit。The program halts at the reset vector after entering the debug mode，a green line with yellow arrow indicates where the program counter is。

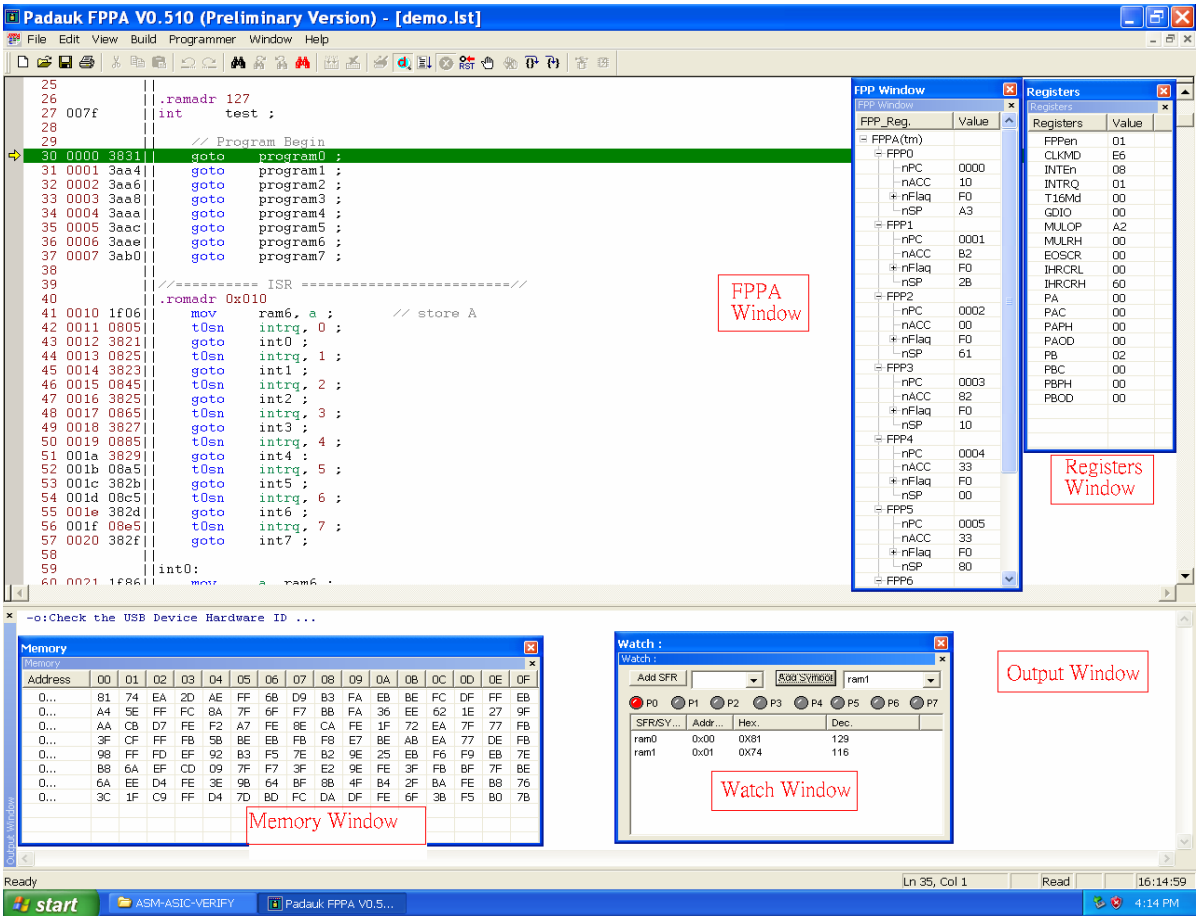

Fig.4-4：Window for Debug Mode

Step 4：In debug mode，"Single Step" and "Step Over" are supported to trace program status line by line。"Single Step" is used to trace all the instruction in one step by clicking  or pressing hot key "F11"，the program will halt at the next program counter after executing the "Single Step"。"Step Over" is used to trace subroutine in one step by clicking  or pressing hot key "F10"，the program will halt at the next program step after executing the "Step Over"。

Step 5：In debug mode，using  to set a break by moving the cursor to the line where you want the program to be stopped，a blue dot  indicates breakpoint had been set successfully，there are maximum five breakpoints can be set。Click  again to clear single breakpoint by moving the cursor to the line where you want。Click  to clean all the breakpoints at the same time。In the FPPA™ architecture，there are more than one program counter in one chip，each program counter belongs to its own FPPA™ correspondingly，FPP unit may be the condition to trap the program counter。Selecting the FPP unit to trap program counter in the debug mode，enabling this dialog from "Build -> ICE Trap Setting"，the window is shown as Fig.4-5。The comparison would not be taken place whenever the active program counter belongs to those disabled FPP units。The default FPP unit for trapping is #0。

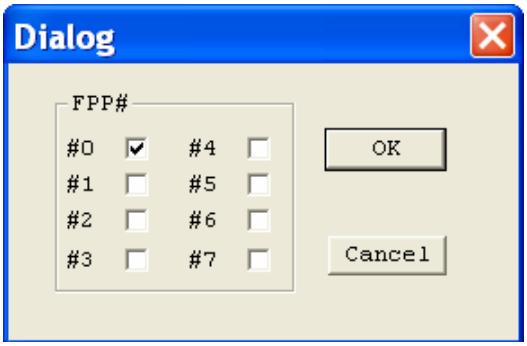

Fig.4-5：Dialog of ICE Trap Setting

Please notice that those unselected FPP units are still active and executing according to the hardware specified timing sequences；Those unselected FPP units are only not for the trapping after program counter comparison。If there is warning message like Fig.4-6，it means that the trap setting condition can not meet the hardware real situation。For example：If the clock resource is shared to all FPP units，however，only FPP #0 and #1 are enabled in your program，those disabled FPP units still occupy some of the clock timing slot although nothing is executed。When you stop the program execution，this timing point may halt at those disabled FPP units，you just ignore this message。

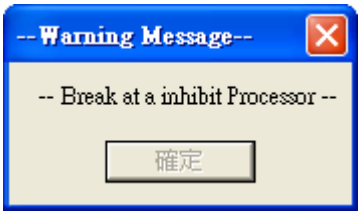

Fig.4-6：Warning Message of inhibit processor

4-4、Description of Toolbar

The functional buttons on the Toolbar are shown in Fig.4-6。According to the different function，these buttons can be classified into four groups：file management、file edit、emulation/debug、program writer。The following describes the function of each button：

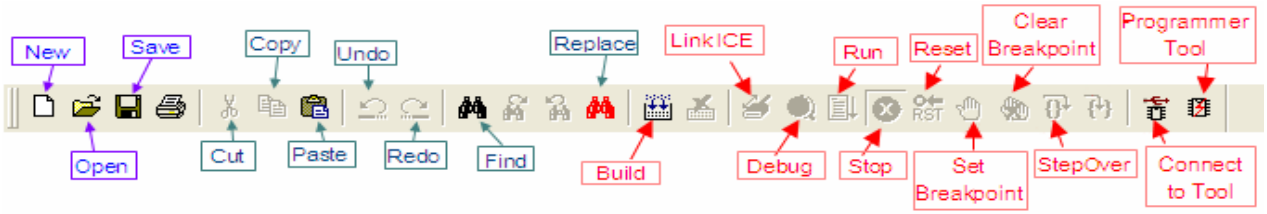

Fig.4-6：IDE Toolbar

4-4-1、File Management

- Open new file。The default extension name of new file is *.asm。
- Open old file。The default extension name of old file is *.asm。
- Save file。The default extension name of save file is *.asm 。

4-4-2、File Edit

- Cut the selected region into buffer。
- Copy the selected region into buffer。
- Paste the data from buffer。
- Undo the previous operation。
- Redo the previous undo operation。
- Find the string。
- Repeat to find the string forward。
- Repeat to find the string backward。
- Find the string and replace by other string。

4-4-3、Emulation and Debug

 Executing assembler and generate list file （*.lst）

 Connecting ICE and downloading program machine code to ICE board。

 Enable the debug mode and open the list file （*.lst）。

 Run command。

 Stop the program execution。

 Reset command to initialize the device and program。

 Set or clear breakpoint，set or clear is a toggle operation。

 Clear all the breakpoints。

 Step-over command to do single step operation for subroutine。

 Step-into command to do single step operation for all instructions。

4-4-4、Program Writer

 To detect USB device and download tool software to "Program Writer" board。

 Open the window for program writer。

4-5、Program Writer

If it is successful to emulate your program in the ICE board，a real chip with your program is required to build the real system。The PDK8S-P "Program Writer" is used to write the user's program into PDK80C real devices，its interface is USB port and capable of bus power operation。The following procedure shows how to write the user's program into PDK80C real devices：

Step 1：Before writing your program code into the real device，please make sure that your program is verified okay in the ICE board and PDK8S-P "Program Writer" is connected to your PC。Click  to connect board to USB port and download tool software to the "Program Writer" board，or select command "Programmer -> Connect" and "Programmer -> Download Tools OS" from menu。

Step 2：Click  to open the window of "FPPA Programmer Tool" or select command "Programmer -> Programmer Tools"，Fig.4-7 shows the window of Programmer Tools。

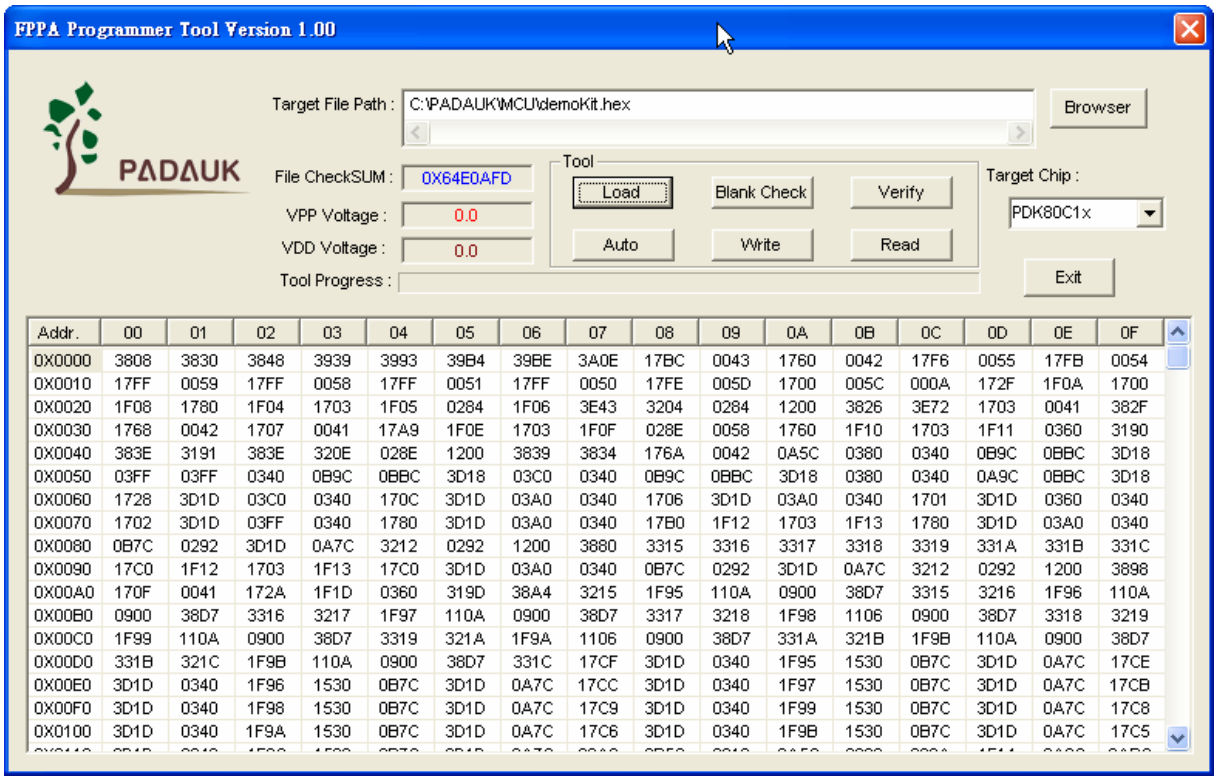

Fig.4-7：Window of Programmer Tools

Step 3：Use 【Browser】 to select the file which you want to program，then，the "The Programmer Tool" will load the machine code in the selected HEX file into the temporary buffer automatically。If the path of HEX file had been set correctly，click【Load】to load the machine code into the temporary buffer directly。Temporary buffer is used for user's inspection and data to be written into the real target device。

Step 4：Select the part number from【Target Chip】。

Step 5：Select【Auto】to write HEX machine code into the target real chip。The function of【Auto】combines 【BlankCheck】、【Write】and【Verify】 into one icon。If all the steps in the above sequence are successful，there will be "SUCCESS" message；otherwise，"FAIL" message is shown。

User can click 【Read】to read back the HEX machine code to temporary buffer from the un-protected target chip，please notice that the data in the temporary buffer is not the expected one if using 【Read】 command to read HEX machine code from the protected target chip，you can not use this temporary buffer to program the new chip。You should load the HEX machine code from file again。

Loading HEX machine code into temporary buffer from file or target chip，the CheckSum is always calculated for reference。The supply voltage to the target chip is measured whenever there is any operation to the target chip from the "Program Writer"。

5. Appendix

5-1、ICE Board

The CN2 in the PDK8S-I ICE board includes all the general purpose I/O pins of PDK80C series as shown in Fig.5-1。The system designer can use Port A ~ Port F to handshake with external devices，the Rdy/Busy LED indicates that ICE is busy or ready，PA.0 button is used to trigger the system manually，PA.1 LED can be used to show the status，external crystal is option to choose the clock source。

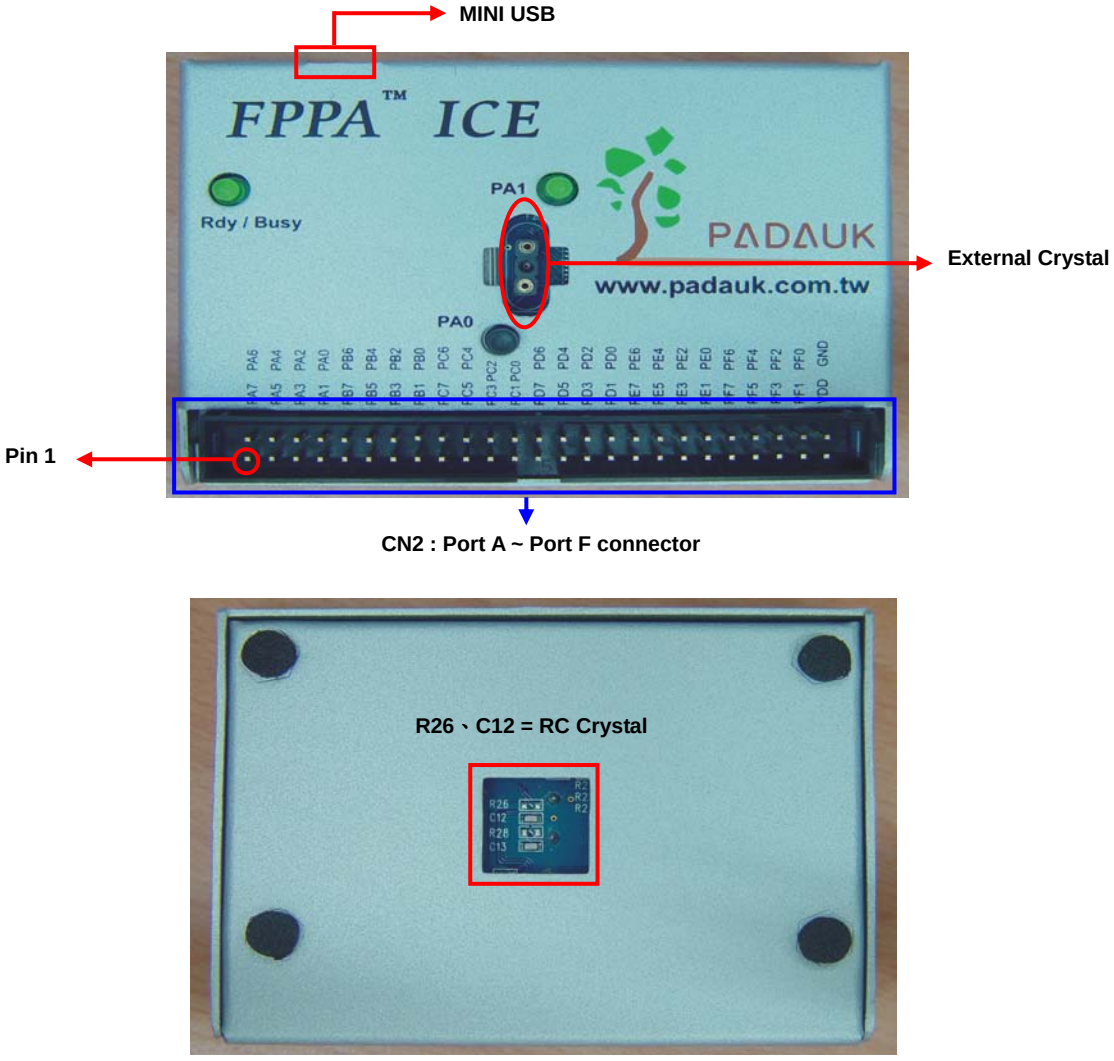

Fig.5-1：GPIO pins of ICE Board

5-2、CN2 Definition

Fig.5-2 shows the pin definition of CN2，and the PA.1/PA.0 circuit in the ICE board。

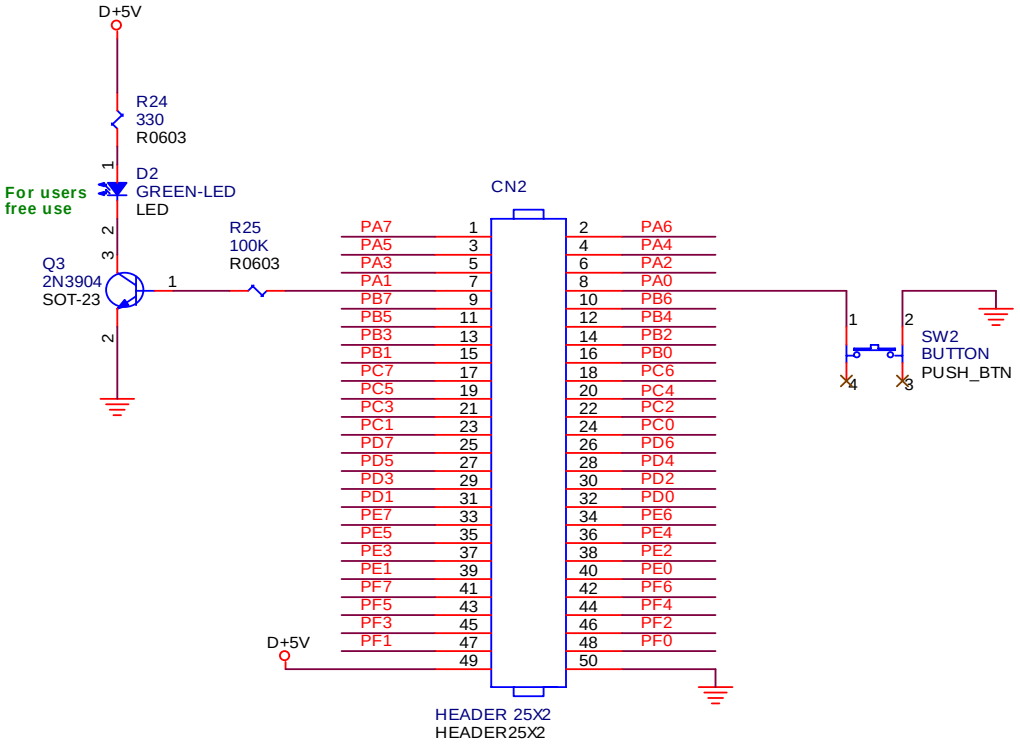

Fig.5-2：CN2 Pin Definition

5-3、ICE Extension Board and Extension Cable

In order to meet the requirement of different device，ICE extension board and extension cable are provided to connect from CN2 to different chips。The PDK8S-D-002 is used to connect devices with 28/40/44 pins and The PDK8S-D-003 is used to connect devices with 14/16/18/20 pins。Fig.6-3 as an example shows the connection from ICE to PDK80C28，similar connection can be done for different devices with different extension board and extension cable。

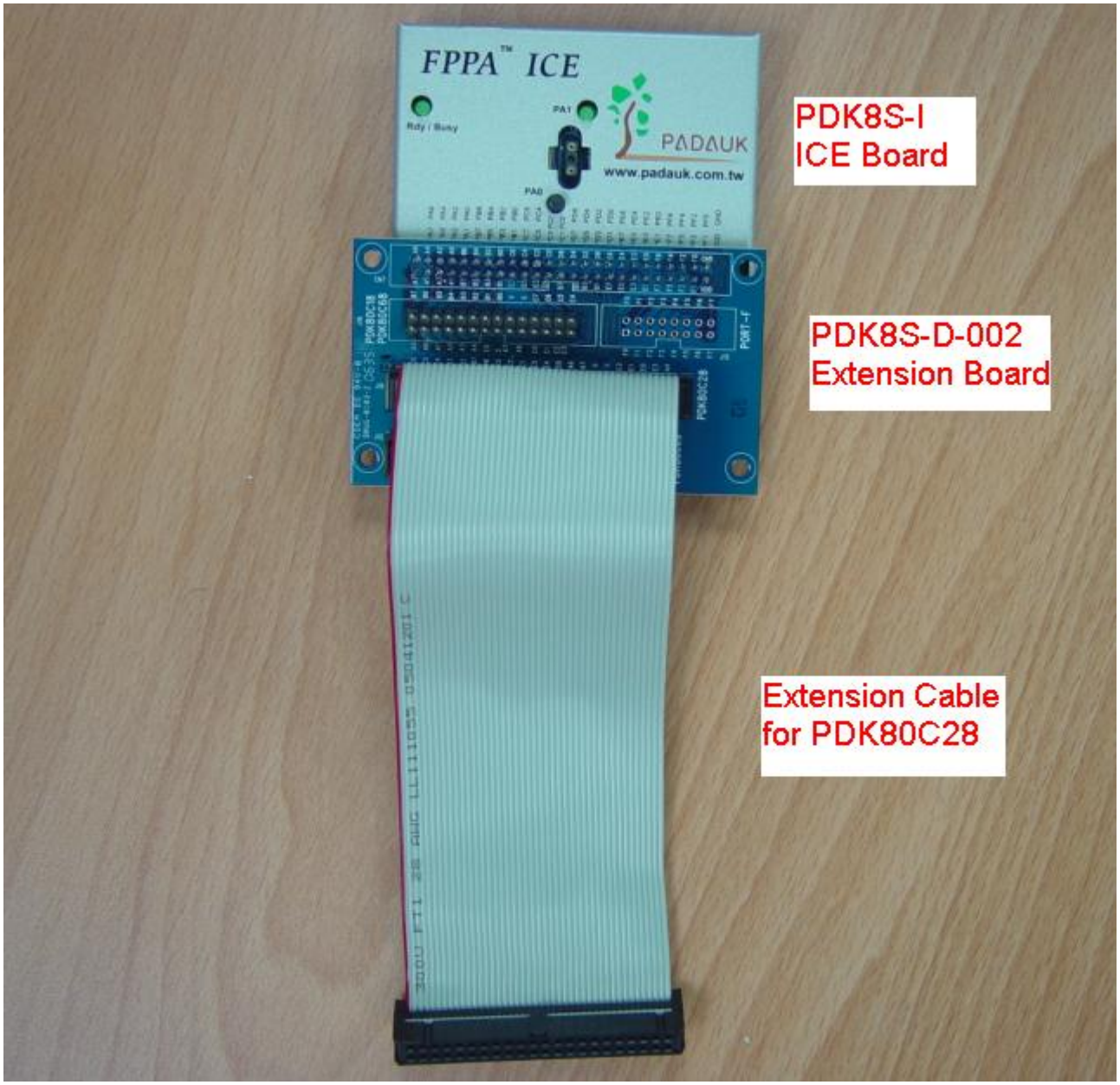

Fig.5-3：Connect CN2 to PDK80C28 socket